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## PATENT SPECIFICATION

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NO DRAWINGS.



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### COMPLETE SPECIFICATION.

#### Protection of Polyvinyl Chloride.

We, UNITED STATES RUBBER COMPANY, of  
Rockefeller Centre, 1230 Avenue of the  
Americas, New York 20, State of New York,  
United States of America, a corporation  
organized and existing under the laws of the  
State of New Jersey, United States of  
America, do hereby declare the invention,  
for which we pray that a patent may be  
granted to us, and the method by which it  
is to be performed, to be particularly de-  
scribed in and by the following statement:—

This invention relates to protecting poly-  
vinyl chloride containing certain plasticizers  
against mildew growth, and against stiffen-  
ing due to plasticizer depletion caused by  
bacteria and fungi.

Polyvinyl chloride is commonly com-  
pounded with 50 to 100 parts of plasticizer  
per 100 parts of the polyvinyl chloride, and  
in the case of certain plasticizers, the poly-  
vinyl chloride is quite susceptible to dis-  
coloration due to microbial growth and sub-  
sequent stiffening when buried in soil.

We have found that N-(3-chlorophenyl)-  
itaconimide is an effective protectant  
against mildew growth of polyvinyl chloride  
containing 50 to 100 percent based on the  
weight of the polyvinyl chloride of plasti-  
cizers such as (a) dialkyl phthalates in which  
the alkyl radicals have 3 to 12 carbon atoms,  
e.g. dibutyl phthalate, dioctyl phthalate and  
didodecyl phthalate, (b) di-acid esters of a  
glycol such as diethylene glycol or dipro-  
pylene glycon or triethylene glycol, and a  
monocarboxylic acid, such as benzoic acid,  
or an alkanoic acid having 2 to 10 carbon  
atoms, e.g. diethylene glycol dipelargonate,  
dipropylene glycol dibenzoate, triethylene  
glycol diacetate, and triethylene glycol di-(2-  
ethyl hexoate), and (c) epoxidized soybean  
oil. The amount of N-3-(chlorophenyl)ita-  
conimide used will be from about .05% to  
5% based on the weight of the polyvinyl  
chloride.

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5% based on the weight of the polyvinyl  
chloride.

The following examples illustrate the in-  
vention. All parts and percentages referred  
to herein are by weight. 45

#### Example 1

The following six polyvinyl chloride (PVC)  
film recipes I to VI were mixed on a two-  
roll mill at 280°F. for 5—10 minutes. 50

I	100 parts of PVC and 70 parts of dioctyl phthalate.	45
II	100 parts of PVC, 70 parts of dioctyl phthalate and 0.7 part of N-(3- chlorophenyl)itaconimide.	55
III	100 parts of PVC, 60 parts of dioctyl phthalate and 10 parts of epoxi- dized soybean oil.	60
IV	100 parts of PVC, 60 parts of dioctyl phthalate and 10 parts of epoxi- dized soybean oil and 0.7 part of N-(3-chlorophenyl)itaconimide.	60
V	100 parts of PVC and 70 parts of dipropylene glycol dibenzoate.	65
VI	100 parts of PVC, 70 parts of di- propylene glycol dibenzoate and 0.7 part of N-(3-chlorophenyl)ita- conimide.	75

Films of 10 mil (0.010 inch) thickness were  
then calendered. Five strips of each film  
(1" x 6") were buried in moist soil highly  
infested with microorganisms and kept at  
86°F. and 100% relative humidity for  
periods of 2, 4, 6 and 8 weeks. Samples  
were removed from the soil after each  
interval and inspected for mildew growth.  
The mildew growth ratings are shown in  
the following table: 70

[Price

Weeks Burial	Mildew Growth Ratings of Compounds					
	I	II	III	IV	V	VI
0	clear	clear	clear	clear	clear	clear
5	2 slight black spotting	none	slight orange spotting	clear	clear	clear
10	4 same	none	heavy orange spotting	slight pinking	moderate orange spotting	clear
15	6 moderate black	none	same	same	same	clear
	8 heavy black spotting	none	same	moderate black spotting	heavy orange spotting	clear

In each case, the inhibition of fungal discoloration is demonstrated with N-3-chlorophenylitaconimide.

*Example 2*

20 This example again illustrates the effectiveness of N-(3-chlorophenyl)itaconimide as a protective agent for the plasticizers in polyvinyl chloride.

25 The polyvinyl chloride films I to VI compounded as in Example 1 were cut into 1 square inch specimens. Duplicate squares were placed under aseptic conditions in

100 × 15 mm Petri plates containing potato dextrose agar as a growth medium. After preparing a spore suspension of the fungus *Aspergillus niger* van Tieghem using 100 ml. sterile distilled water per one week old slant the Petri plate were inoculated at 30 C. for periods of one and two weeks. At that time, the polyvinyl chloride specimens in the Petri plates were examined under the microscope for fungus growth. The results were recorded and expressed as none, trace, slight, moderate, and severe mildew growth on the PVC film as follows:

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Mildew Growth Ratings of Compounds

Incubation	I	II	III	IV	V	VI
1 week	trace	none	slight	trace	slight	none
2 weeks	slight	trace	severe	trace	moderate	none

45 This example again illustrates the effectiveness of the chemical of the present invention in protecting the plasticizers from mildew growth.

wherein the plasticizer is a dialkyl phthalate in which the alkyl radicals have from 3 to 12 carbon atoms, a di-acid ester of a glycol and benzoic acid or an alkanoic acid having from 2 to 10 carbon atoms or epoxidized soya bean oil.

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4. A composition as claimed in Claim 3 wherein the di-acid ester is derived from diethylene glycol, dipropylene glycol or triethylene glycol.

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5. A composition as claimed in Claim 1 substantially as described in any one of the foregoing Examples.

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WHAT WE CLAIM IS:—

50 1. A polyvinyl chloride composition containing from 0.05 to 5 per cent of N-(3-chlorophenyl)itaconimide based on the weight of the polyvinyl chloride.

55 2. A composition as claimed in Claim 1 which further comprises from 50 to 100 parts by weight per 100 parts of the polyvinyl chloride of a plasticizer.

3. A composition as claimed in Claim 2

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